

**Remarks**

**Status of Claims**

Claims 1-42 are currently pending in the application. Claims 1-10 and 13-42 have been amended in this paper. Claims 11 and 12 have been cancelled without prejudice. New claims 43-45 have been added.

Claim 43 is based on page 9 line 21 to page 10 line 7 of the international application as filed and published. Claim 44 is based on original claims 1, 3, 4, 6 together with page 9 line 21 to page 10 line 7 in the description of the international application as filed and published. Claim 45 is based on original claims 10 and 12.

No new matter has been added by these amendments.

**Claim Objections – Informalities**

Claims 2-34 were objected to because of informalities. In response, these claims have hereby been corrected to add the word “The” in accordance with the Examiner’s recommendation.

Claims 37-42 were objected to because of informalities. These claims have hereby been corrected to add the word “The” in accordance with the Examiner’s recommendation.

Claim 6 was objected to because of an informality. Claim 6 has hereby been corrected to give antecedent basis in accordance with the Examiner’s recommendation.

Claim 30 was objected to because of an informality. Claim 30 has hereby been corrected to give antecedent basis in accordance with the Examiner’s recommendation.

It is respectfully submitted that the Examiner's objections in paragraphs 1-4 of the office action are hereby overcome, and should be withdrawn.

**Claim rejections – 35 USC § 102**

Claims 1-7, 10, 13-15, 20-22, 24, 26-29, 31-33, 35-42 were rejected under USC § 102(b) as being anticipated by Yancey (US2794617).

In response to this objection, claim 1 has been amended to recite the following:

*“a clamp configured to clamp the apparatus to the drill string in use”*

This is supported in the specification as filed page 15 lines 13-14, and for example page 9, line 8 and elsewhere referring to the clamp as part of the apparatus.

Independent claims 35 and 36 have been similarly amended. Claim 6 has been amended and clarified to refer to the bushing being connected to the sleeve, not just mounted thereon. This is supported by the description page 10 line 7 of the international application as filed and published.

Yancey does not disclose or suggest any clamp, and does not disclose or suggest any apparatus that is clamped to a drill string in use. In contrast with the embodiments of the invention as now claimed, the apparatus described in Yancey is in the form of a sub that is incorporated into the drill string itself by way of threaded end connections that screw into adjacent drill string sections. The apparatus of the embodiments of the invention claimed is provided separately of the drill string and clamped onto an already-formed drill string. Yancey is clearly not concerned with a clamped apparatus and accordingly Yancey does not anticipate the embodiments of the invention under 35 USC § 102.

The apparatus of the embodiments of the present invention therefore represents a different category of product to that of Yancey, and since it is clamped to the drill string in use, rather than being incorporated into a drill string as in Yancey, the present invention provides for particular technical advantages. For example, the apparatus of the invention can be clamped around a section of pipe while the pipe is separately screwed into the string, avoiding therefore extra screw connections in the drill string between the apparatus and the adjacent pipe section (as would be associated with a sub as proposed in Yancey). This improves the flexibility of the drill string, because extra screw connections in the drill string increases its stiffness which can be undesirable and can lead to problems in highly deviated wells.

Components that are to be connected together to make up the drill string are initially provided on a rack near the point of incorporation into the drill string before being positioned and connected to an adjacent drill string component well side. The sub of Yancey has a length that is inconsistent with that of the longer drill pipe components that make up most of the drill string and which will in practice be stored alongside the sub in the storage rack. Due to these length differences, the Yancey sub requires additional maneuvering and handling to install it correctly into the string which in turn makes the Yancey sub relatively inefficient to use. Where a clamped apparatus of the present embodiments of the invention is used, it is provided to the string separately from the string components themselves, and accurate maneuvering of a sub tool from a rack to install into the string is not required since it can be simply clamped around an outer surface of one of the drill pipe sections before that is installed in the normal way.

In addition, the apparatus as now claimed is particularly versatile since because it is a clamped apparatus, it can be formed in one definitive material composition that does not need to match the material of the drill string. Pipe sections and subs, such as the Yancey tool, which are screwed together end to end to make up the body of the drill string, are required to be made from the same materials as are used in the drill string. These materials often need to be specially treated or formed to be suitable for the

particular fluids and acidity conditions persisting in the wellbore so that the whole drill string can for example resist corrosion or other wear when drilling a well. For example, where sulphides are present in a well, a drill string made from higher chrome steels may be desirable. Subs and pipe sections must always be provided in matching material compositions to maintain rigidity, sufficient strength under the very high axial loads to which the string is subjected during drilling, and predictability of bending of the drill string, as well as to maintain a consistent resistance to downhole corrosive fluids. If the subs and other integral components of the drill string were to be made of a different, less exotic material, then a skilled person would know that the resultant weak spot in the body of the string would compromise the performance and structural integrity of the drill string as a whole. In order to be used for different conditions therefore, several versions of the Yancey sub would need to be made in different materials and stored at the installation point (e.g. on a rack), so that the matching one can be selected to be used in the drill string according to the well conditions. The embodiments of the present invention, as a result of being a clamped product, rather than an integral part of the drill string, avoids those restrictions, and provides improved compatibility with drill strings of different materials.

Because only a single version of the tool of the claimed invention is required to achieve this, it also saves on materials and costs, and provides improved manufacturing efficiency. It also reduces the rig floor footprint of the apparatus, because it avoids the need for many different versions to be stored near to the wellbore for incorporation into the drill string.

The embodiments of the invention as now claimed also allow the clamped apparatus for mobilising the cuttings to be clamped onto an ordinary drill string at various different locations thereof, so that the spacing between adjacent the adjacent clamped pieces of apparatus can be determined at the well site, and adjusted as necessary, without any effects on the rigidity or length of the string. Individual units according to the invention can even be moved along the stands of drill pipe making up the string before the clamp is tightened, so that the spacing between adjacent clamped units can be

adjusted in order to e.g. space them closer together to create high turbulence in particular zones of the wellbore that are known to be hotspots for accumulation of cuttings, and to space them wider apart in areas of the wellbore where cuttings are not so problematic. This kind of flexibility is not considered by Yancey (and not possible with that system).

The embodiments of the present invention therefore overcome problems of improving flexibility of the drill string and improving efficiency of installation and efficiency of storage and manufacture. None of these problems are considered or suggested by Yancey. To the contrary, it is a premise of the Yancey reference that the tool be incorporated into the drill string, and a skilled person would not be led to do otherwise.

Moreover, turning the Yancey arrangement into an apparatus that clamps onto a drill string would require major redesign of several components of Yancey and a skilled person would need to overcome several technical hurdles, for example, how to assemble the blades and vanes of the apparatus so that the apparatus can be connected to the string using a clamp, and then how to make sure that the vanes and blades are able rotate relative to one another when the apparatus is connected in that way. There is no teaching in Yancey of how this might be carried out and it is not a straightforward modification to carry out.

In view of the above, it is not disclosed by Yancey, and not obvious to arrive at the embodiments of the invention of Claims 1, 35 and 36 and the embodiments of the invention are therefore not anticipated by Yancey. The remaining claims are also patentable as they depend from independent claims 1, 35 and 36. It is submitted that the Examiner's rejections under 35 USC § 102 should be withdrawn.

**Claim rejections – 35 USC § 103**

Claims 8, 9, 16-19 and 30 have been rejected under 35 USC § 103(a) as being unpatentable over of Yancey in view of Zublin (US2005767).

Claims 8, 9, 16-19 and 30 are all dependent, either directly or indirectly, from independent claim 1.

Neither Zublin nor Yancey disclose or suggest any kind of clamp by which the apparatus is clamped around a drill string in use. Notably, Zublin is not even intended to be used with a drill string. It is a separate agitator tool designed to sit passively in the well to stimulate well flow and is used in the post-drilling production phase of a well. Yancey on the other hand is designed to be integrated in a drill string during the drilling phase. Thus, the Zublin and Yancey documents concern fundamentally different applications and therefore a skilled person aiming to improve the Yancey system and looking to Zublin for that purpose would not consider that the Zublin system had anything to offer by way of improvement.

Also, as set out above, neither Yancey nor Zublin disclose the feature of the clamp, and therefore even if these were considered in combination, the combined disclosure does not have or suggest the claimed feature of the clamp by which the apparatus is clamped to a drill string in use, and thus a skilled person considering the Zublin and Yancey documents in combination would still lack any hint or suggestion of the clamp as required in the embodiments of the claimed invention, and it would therefore not be obvious to arrive at the embodiments of the invention on the basis of these references.

The embodiments of the invention as claimed in claims 8, 9, 16-19 and 30 as amended, having a clamp by which the apparatus is clamped to the drill string, are therefore not obvious as argued above in relation to Yancey, and it is submitted that the Examiner's rejection under 35 USC § 103(a) should be withdrawn.

Claims 11, 12, 13, 23 and 25 were rejected under 35 USC § 103(a) as being unpatentable over Yancey.

Claims 11, 12, 13, 23 and 25 are all dependent on claim 1, and are therefore patentable for the reasons set out above for Independent claim 1.

As discussed above in relation to claim 1, Yancey does not disclose or suggest any clamp by which the apparatus is clamped around a drill string in use. In particular, adapting the Yancey arrangement to be clamped to a drill string is not a straightforward or routine modification. Accordingly the embodiments of the invention set forth in claims 11, 12, 13, 23 and 25 are not obvious in view of Yancey, and it is submitted that the Examiner's rejection of these claims under 35 USC § 103(a) should be withdrawn.

Claim 34 has been rejected under 35 USC § 103(a) as being unpatentable over of Yancey in view of Shizawa (JP62101149).

Shizawa also does not disclose or suggest any clamp by which the apparatus is clamped around a drill string in use. Notably, Shizawa is not concerned with wellbore apparatus, and does not consider any of the problems solved by the embodiments of the present invention. A skilled person would derive no motivation from Shizawa to adapt the Yancey apparatus to incorporate a clamp as recited in claim 34. The Yancey and Shizawa references would therefore not be considered for combination by a person skilled in the art. As set out above, Yancey also does not disclose the feature of the clamp, and therefore even if these documents were considered in combination, the combined disclosure does not disclose or suggest the feature of the clamp by which the apparatus is clamped to a drill string in use, and thus it would therefore not be obvious to arrive at the embodiments of the invention on the basis of these two references.

The embodiments of the invention now recited in claim 34 as amended, having a clamp by which the apparatus is clamped to the drill string, are therefore patentable as argued above in relation to Yancey, and it is submitted that the Examiner's rejection under 35 USC § 103(a) should be withdrawn.

### **Conclusion**

The Applicant respectfully submits that the application is in condition for allowance, and reconsideration and notice of allowance are respectfully requested. If the Examiner believes that prosecution might be advanced by discussing the application with the Applicant's counsel, in person or over the telephone, the Applicant's counsel would welcome the opportunity to do so.

Respectfully submitted,

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